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THE PRESENT STATUS OF SCOLOPENDRIUM IN NEW YORK STATE

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(Received for publication May 6, 1921)

The purpose of this paper is to offer data concerning the occurrence and abundance of *Scolopendrium vulgare* Sm. in the central New York area. Its former distribution is also considered and comparisons are made in an effort to throw some light upon its probable future. The work was begun in the autumn of 1916, and was completed in January, 1921. Data concerning several of the colonies have been obtained from field notes and other information kindly placed at my disposal by Dr. Loren C. Petry of Syracuse University, Dr. M. S. Markle of Earlham College, and Dr. John B. Todd, a physician of Syracuse.

While certain topographic conditions due to glacial action are coincident with the occurrence of Scolopendrium in this region, it is not deemed necessary to give details of this topography[1] beyond a brief mention of the three well-defined situations under which Scolopendrium occurs. These situations are: (*a*) on the south slopes of glacial channels, which usually extend almost due east and west; (*b*) on the south and west slopes of deep plunge basins which head such channels; (*c*) on the west slopes of steep gorges cut by post-glacial streams flowing in a northerly direction. The latter situation occurs only at the Chittenango and Perryville Falls stations. These three situations are all similar in certain respects. The slopes are usually bordered by an overhanging cliff, and in all instances where this is the case Scolopendrium occurs well below the cliff, about midway of the slope. A further characteristic of its occurrence is that of growing in distinct groups or colonies, with no scattered plants between.

In this paper the term "station" is applied to the widely separated regions; distinct areas within the stations are termed "substations," and these may in turn be divided into "colonies."

The first comprehensive account of the occurrence of Scolopendrium in the New York area was published by Maxon (2) in 1900. In this paper he gives an account of the discovery of the various stations of Scolopendrium in America, along with facts concerning its condition at various stations at that time. Since 1916 the stations in central New York cited by Maxon have been relocated, the surrounding areas examined, and all discoveries carefully mapped (figs. 1, 2). More detailed maps are on file in the Department of Botany, Syracuse University, and copies of these are available to anyone interested. For convenience the stations will be discussed in the order in which Maxon describes them.

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[1] For a discussion of the physiography of this area the reader is referred to the series of papers on this subject by Dr. H. L. Fairchild, and especially to his *Glacial Waters in Central New York*, N. Y. State Museum Bull. 127. Albany, 1909.

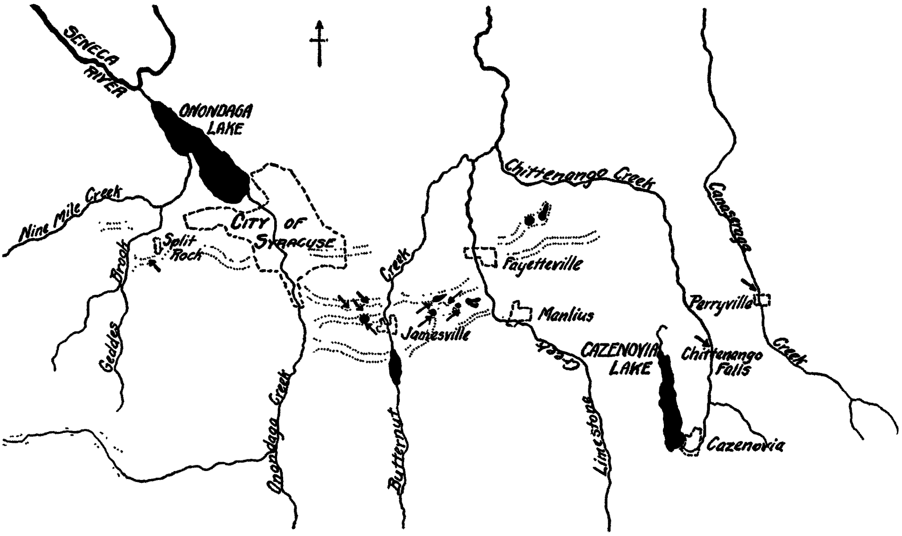

FIG. 1. Map showing Central New York stations for Scolopendrium. Stations are indicated by arrows; cliffs bordering glacial channels and plunge basins are shown by dotted lines. Scale: 1 inch = 8 miles.

I. GEDDES (SPLIT ROCK) STATION

Scolopendrium was first discovered in America by Frederick Pursh (7) in 1807 on "Geddes plantation," west of Syracuse and near the present village of Split Rock. In 1866 Mr. J. A. Paine (3) searched the region but failed to find Pursh's station. In 1879 the Syracuse Botanical Club (8) rediscovered Scolopendrium at what seemed to be Pursh's station. Reports show that it flourished there until 1895 when it was thought to have been exterminated by quarrying operations of the Solvay Process Company.

There is some doubt as to the exact location of Pursh's original station. In his *Flora Americae Septentrionalis* (6) Pursh mentions "shady woods among loose rocks." In his *Journal* (7) he refers to

> A deep valley where we ascended a steep rocky hill; here large masses of rock seemed to be piled up or turned over on one another in such a confused manner that it has left chasms between them which sometimes appear like caves.

It is quite probable that the deep valley referred to by Pursh is the one through which the Syracuse and Auburn Electric Railway now runs. The quarrying operations referred to were confined to the region south of this valley, and resulted in the removal of a mass of rock of probably fifty feet in thickness all along the valley. A search of this valley, known as Split Rock Ravine, by Dr. Petry in the autumn of 1918 resulted in the discovery of a single small colony. This colony, consisting of six mature[1] plants, six young plants, and three groups of prothallia, is located on the south slope about fifty feet down from the base of the low cliff. It is just west of a dump of the Solvay picric acid plant and midway between it and a rock slide. It has since been learned that this colony had been discovered several years earlier by Dr. John B. Todd.

In view of the extended lapse of time between the various discoveries of Scolopendrium at Split Rock, together with the lack of precise information as to the location of the original colony described by Pursh, it is difficult to decide whether the three reports (Pursh, 1807; Syracuse Botanical Club, 1879; Petry, 1918) refer to the same or to different colonies. The quarrying operations have disturbed the region to such an extent that it is impossible to trace the details of topography mentioned in the former description, but the traces of the original general topography indicate that the present colony is at least in the vicinity of Pursh's original colony. The fact that observations elsewhere offer no evidence of formation of new colonies leads to the conclusion that the present small colony in Split Rock Ravine is either a remnant or an outlier of Pursh's original station.

II. Chittenango Falls Station

At this station Chittenango Creek flows in a northerly direction and plunges over a precipice one hundred feet or more in height, forming a deep gorge below. The west bank of this gorge is exceedingly steep and rocky, while the east bank is sloping and covered with soil. A short distance below the fall two ravines enter the gorge from the west, at right angles to the stream. The discovery of Scolopendrium at this station by William Cooper in 1830 was first published by Gray (1) in 1866. Maxon (2) reported in 1900 that it grew scattered along the west bank below the falls for "a distance of nearly a quarter of a mile." At the present time Scolopendrium occurs abundantly on the south bank of the second ravine below the gorge and from that point along the west bank of the main gorge up to within about 150 yards of the falls. Here, as elsewhere, it shows the characteristic habit of growing in groups or colonies.

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[1] In dealing with the actual number of plants it has been found convenient to classify them into three groups: (*a*) mature plants, those having at least one leaf bearing sori; (*b*) young plants, those having one or more leaves of typical shape but not bearing sori; (*c*) sporelings and prothallia. This last group includes all the stages from the time the prothallia are recognizable up to the time when the leaves take on the characteristic shape.

The prothallia and sporelings almost invariably occur in groups which may contain several dozen individuals; these groups seldom contain prothallia of other species, but when such mixed groups do occur, the Scolopendrium prothallia are easily distinguished from the other species. In tabulations, prothallia and sporelings are listed by groups, and no attempt has been made to count the individuals.

III. PERRYVILLE FALLS STATION

The Perryville Falls station lies about three miles northeast of the Chittenango Falls station, at the point where Canaseraga Creek has formed a deep gorge. Scolopendrium was discovered here in 1898 by Miss Murray Ledyard of Cazenovia (4).

In August, 1919, this station was visited and the entire region below the falls in which Scolopendrium might be expected to occur was explored. At a distance estimated to be 150 yards down stream from the crest of the falls and 40 feet above the stream level, a colony of thirteen mature plants, three young plants, and two patches of prothallia was located. A little to the south of this was a single young plant, and still nearer the stream bed one mature plant and a group of prothallia were found. Dr. Petry's field notes describing the colony at this time say:

> The plants were vigorous and were fruiting strongly; the sporangia, however, were not nearly mature at this time. The plants here were considerably smaller than those at the Chittenango Falls station. There were, nevertheless, the normal number of leaves. Altogether it may be said there is no evidence that the colony is not maintaining itself.

A second visit in October, 1920, showed some surprising facts. The colonies were again located and the plants counted. Fifteen mature plants, ten young plants, and nineteen groups of prothallia were found. The young, straggling plants had become mature plants, and the groups of prothallia were in a very flourishing condition.

It is to be noted that in the cases of both the Chittenango and the Perryville Falls stations we have the same physiographic conditions, *i.e.*, gorges below waterfalls. In each case the gorge is deep with vertical cliffs and steep slopes covered with *débris*, soil, and broken fragments of the thick-bedded, chert-bearing layers of the Onondaga limestone. Scolopendrium occurs on the west slope of the gorge in each instance, the east slope being of an entirely different botanical make-up.

IV. JAMESVILLE STATION

This is at once the best known and most accessible of the New York stations. It consists of a series of colonies scattered through the maze of glacial channels and plunge basins lying on either side of the village of Jamesville. The colony nearest to Syracuse lies not more than three miles outside the city limits, and two colonies (*B*, fig. 2) lie within the Clarke State Reservation. The colonies east from Jamesville lie in very rough country, but all are within easy walking distance of trolley lines. In spite of this, their exact location is known to relatively few people.

A. Howlett's Gorge (Hanging Valley) Substation. The first discovery of Scolopendrium in the Jamesville region was made by Mr. Lewis Foote (1) in 1866, at Howlett's Gorge, now better known as Hanging Valley. An examination of this area in November, 1920, showed a thrifty colony of somewhat scattered plants on the north side of the ravine. In this particular, namely, its location on a south-facing slope, this colony is unique in the New York area; but equally peculiar is its occurrence on outcrops of Fiddler's Green limestone of the Camillus series, a full hundred feet below the horizon of the Onondaga limestone on which all the other colonies of this area are located.

B. Little Lake (Green Lake) Substation. In September, 1866, Paine (3) discovered Scolopendrium on the southern slope of the cliff surrounding Little Lake, or Green Lake, as it is now known. Maxon (2) states that

> The plant was formerly very abundant but scarcely half a dozen plants may now be found, owing to the greed of picnickers.

A careful search of this region in November, 1920, disclosed a colony of forty or more thrifty plants high up on the slope south of the lake. To the southeast of the lake, on the west slope of a plunge basin which contains water for a short time each spring, is another colony of fifty or more plants. Both these colonies are within the Clarke State Reservation.

Maxon also mentions the occurrence of Scolopendrium in two wooded ravines from thirty to forty rods north of the lake. This region will be discussed in detail later as the Jamesville Woods substation. It is sufficient to say here that it is at the present time the most promising substation of the Jamesville area.

C. Green Pond Substation. Mr. Paine in the same year found Scolopendrium at Green Pond, a lake similar to Green Lake and located one and one half miles east of Jamesville (*C*, fig. 2). Of this location, Maxon (2) reported that the fern grows

> Pretty well up on the sides at the base of the U cliff which surrounds Green Pond. . . . The plants from the cleared eastern portion become of small size and winter kill badly.

At the present time, Scolopendrium is not found at the eastern side of the lake; its disappearance from this area is probably due to clearing followed by fire. Beginning almost directly south of the center of the lake, the fern occurs very abundantly on the upper part of the slopes along the southern and western sides of the lake. In one area about twenty-five feet square, ninety plants were counted. Along a part of the cliff top, plants in considerable numbers occur on the level ground immediately back of the rim; and in the bottom of a shallow plunge basin a few hundred yards south of the rim a few small but mature plants were found.

D. Rock Gorge Substation. This substation was first discovered by Maxon in 1900, at which time he reported "125 extremely fine plants growing very thriftily." This colony is still in a flourishing condition. However, the small colony reported as located "in a small depression some 40 rods to the westward and back from the amphitheater" has not been rediscovered, although the region has been examined carefully.

E. West White Lake Substation. Southwest of White Lake, and equidistant from it and Green Pond, lies a large plunge basin in which Scolopendrium is very abundant. This colony was not mentioned by Maxon but has been reported by Petry (5). Unfortunately this substation lies directly in the path of development of nearby quarrying operations and will probably be destroyed in the near future.

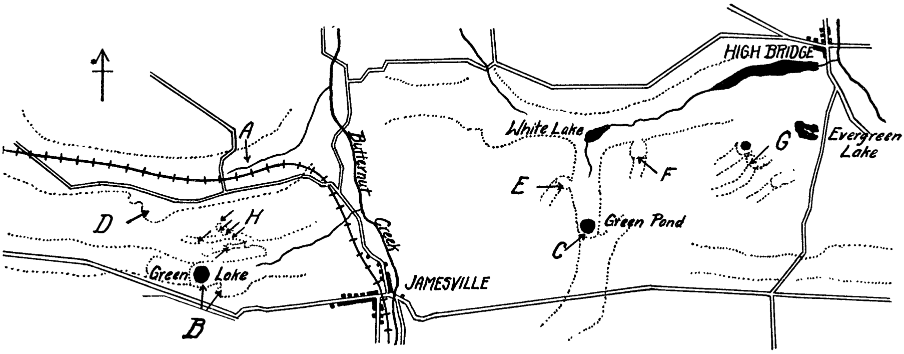

Fig. 2. Detail map of the Jamesville station. Colonies of Scolopendrium are indicated by arrows; cliffs bordering glacial channels and plunge basins are shown by dotted lines. Substations are as follows: *A*, Howlett's Gorge; *B*, Green Lake; *C*, Green Pond; *D*, Rock Gorge; *E*, West White Lake; *F*, East White Lake; *G*, Evergreen Lake; *H*; Jamesville Woods. Scale: 1 inch = 1½ miles.

During the progress of the field studies it has become evident that Scolopendrium is restricted in the central New York area to a very limited habitat, and that it need not be looked for except in regions of a definite topographical character. Systematic search of practically all localities of this character between Split Rock on the west and Perryville Falls on the east has been made, and has resulted in the discovery of two substations not heretofore recorded. It cannot of course be stated positively that Scolopendrium does not occur elsewhere in this area; but the writer believes that no large colonies have been overlooked in the survey.

F. East White Lake Substation. This substation was located some years ago by Dr. Todd, who kindly furnished information with regard to its location. It is located on the south and west slopes of a large plunge basin (*F*, fig. 2), and contains two colonies of approximately twenty and sixty plants respectively.

G. Evergreen Lake Substation. About one half mile to the west of Evergreen Lake (known locally as "Bullhead Pond") lies an extensive area of ravines and plunge basins. A striking feature of the region is a very deep crescent-shaped ravine. On the west slope of this ravine is a thrifty colony of fifty or more plants (*G*, fig. 2). About 200 yards east of this colony, on the same slope, is a single large mature plant. This substation was first discovered in October, 1920.

The data given above answer one of the questions most often asked with regard to Scolopendrium in New York, namely, whether the species has disappeared from any of the recorded stations. Another question of equal interest is whether the number of individuals in the various colonies is dwindling at the present time and thus forecasting the disappearance of the species in this area. To determine this latter point a detailed study of one particular substation, that in Jamesville Woods (*H*, fig. 2), has been made. This locality was selected for study because it is the most accessible area containing more than one colony.

H. The Jamesville Woods Substation. The special study of this substation was begun in the autumn of 1916. The entire area is dissected by a maze of ravines and plunge basins in which the colonies of Scolopendrium occur. A sketch map of the region was made, and the locations of the six colonies found were indicated on this. Each colony was then examined in detail, and a careful census of the plants was made. To accomplish this, each area was divided into strips from ten to twenty feet in width and extending from the bottom to the top of the slope. These strips were then examined in order, beginning each time at the foot of the slope; the plants found were recorded as mature plants, young plants, or groups of prothallia, as already described. The census of selected strips was checked by recounts, and in one instance an entire colony was recounted.

In the autumn of 1920, a second census of the colonies was made by the use of the same methods. The results of the two counts are given in table 1.

TABLE 1. *Jamesville Woods Substation*

Colony	Number of Mature Plants		Number of Young Plants		Number of Groups of Prothallia and Sporelings	
	1916	1920	1916	1920	1916	1920
I	159	197	56	85	38	60
II	109	115	45	36	17	23
III	17	8	4	5	7	3
IV	119	206	36	89	17	52
V	29	20	9	4	6	2
VI	136	92	86	72	35	48
Totals	569	638	235	291	120	188
Increase		69		56		68
Increase percent		12.1		23.8		56.6

As shown by the table, the number of mature plants in the substation increased 12.1 percent in four years. The increase in young plants and groups of prothallia has been even more rapid, and is interpreted to mean that the increase in number of mature plants may be expected to continue in the immediate future.

This increase, however, is not common to all colonies of the substation, colonies III, V, and VI showing a decrease instead. Colonies III and V lie in the same ravine with colony IV, and are in fact extensions of that colony. Colony III occurs on the south slope of a shallow portion of the ravine. The plants grow near the top of the slope, much higher than is usual, and the shallowness of the ravine leaves them considerably exposed. Field notes taken during the 1916 census say, with regard to this colony, that "while the plants here seem to be vigorous they are smaller, less abundant in a given area, and much more exposed; the habitat more nearly resembles . . . the upland forest." The decrease in number of plants revealed by the second census may be taken to indicate that this small colony has moved somewhat too far out of the habitat most suitable for the species.

Colony V is located on nearly level ground at the opposite end of the ravine containing colony IV. This unusual habitat for Scolopendrium has already been mentioned as occurring also in part of the Green Pond substation, but has been found nowhere else. As at colony III, the plants are smaller and more widely scattered. Here also the decrease in numbers is explained by the exposed habitat.

Colony VI, which also showed a decrease in numbers of plants, presents a different situation. This colony is located on the south slope of a deep ravine, under conditions thoroughly typical for Scolopendrium. At the time of the first census it was noted that many of the plants were very superficially rooted; field notes say that "large plants grow on rocks covered with mosses and liverworts." At the time of the second census a condition of drought prevailed in this ravine and these rock coverings of humus were completely desiccated. As a consequence, only those plants which were rooted in crevices between rocks and in other moister situations had survived. It is to be noted that the prothallia which usually occur in these more sheltered situations have increased in this colony at the same time that young and mature plants have decreased in number.

The second census also brought out the fact that not only may colonies change rapidly in number of individuals, but an increase in one portion of a colony may be accompanied by a decrease in another area of the same colony. For example, the notes of the 1916 count of colony IV show that at that time the larger number of plants occurred in the eastern portion of the ravine. In 1920 the western portion of the colony contained by far the greater number of plants. It is hoped to learn more about this shifting of populations within colonies and its relation to the fluctuations in total number of individuals by annual counts of the colonies of the Jamesville Woods substation.

The results of the two counts already completed make it certain that at the present time the number of plants of Scolopendrium in the Jamesville Woods area is increasing. As stated above, a similar conclusion is indicated for the Perryville Falls station by comparison of the conditions there in 1919 and in 1920. These two sets of exact data, considered in connection with the persistence of the species in all its described stations and including its virtual reëstablishment at the Green Lake substation, lead to the conclusion that Scolopendrium is at the present time becoming more abundant.

SUMMARY

1. All described stations for *Scolopendrium vulgare* Sm. in the central New York area have been located, and the fern has been found in greater or less abundance at each.

2. Two new substations for the species have been discovered in the Jamesville area.

3. The number of individual plants in the six colonies of the Jamesville Woods substation was determined in 1916 and again in 1920. Comparison of the data shows that Scolopendrium is becoming more abundant.

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